

# Value Stream Mapping: A Case Study of Assembly Line in Automobile Industry

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**Abstract**— A value stream is the succession of procedures of making, creating, and to the market. Value Stream Mapping (VSM) is the one of the lean assembling tool. It catches the data at individual station. stations about station reduces process time, up time or use of assets, set-up time or cycle time, work in process inventory, man power, lead time, takt time, change over time and proper flow of information and material to finish material. It covers both value as well as non-value adding operation. This paper implementation of value stream mapping is an automobile industry and reduced all the parameter is given above and making future scope map.

**Key words:** Lead Time, Cycle Time, Value Added and Non-Value Added

## I. INTRODUCTION

Value stream mapping is a lean manufacturing technique used to analyze and design the flow of material and information required to bring a product of service to a customer. It provide optimum value to the customer through a complete value creating process with minimum waste in design (concept to customer) build (order to delivery) sustain (in use though life cycle to service) it is provide a visual view of work processes, improve work strategies and deepens an understanding of elimination waste and delivering value.

### A. Lean Manufacturing:

Lean Manufacturing is an operational methodology situated toward accomplishing the most available cycle time by removing of waste. It is gotten from the automobile Production System and its key push is to increment the value added work by reducing waste also, diminishing coincidental work. The system regularly diminishes the time between a consumer order and shipment, and it is intended to drastically move forward benefit, consumer satisfaction, throughput time, representative morale

## II. LITERATURE REVIEW

Value stream mapping in many companies The famous case which happened in Hardik.B.Pandya -provide good understanding and implementation of lean manufacturing (2015), Praveen Saraswat Reduction of Work In Process Inventory (2015), Manoj Bhalwankar- improvements in automotive seat (2014), S. Wu, X. L. Zhao (2016) Application in the Production Line Optimization

There are four major cause of value steam mapping is major finding –

- 1) Future scopes of waste reduction are not specified.
- 2) The warehouse is suggested for storage purpose but the proper location is not given.
- 3) Can also describe parametric variation of no. of workers, machine position and material handling time.
- 4) No proper technique is applied for data collection and setting standard.

## III. RESEARCH OBJECTIVE

The overall aim of this research is to increase the productivity with the help of value stream mapping in automobile industries and reduced the man power, lead time and minimum waste.

- 1) Proper flow of information and material in assembly line.
- 2) To achieve process optimization.
- 3) To create the future state of VSM tool using various technique.

## IV. REDUCING TIME IN VSM SYSTEM

- 1) Cycle time: It is the real time required to finish a part at one station. Most extreme work of Bottleneck Station in a line. Process time describes to what extent it takes to finish a specific task from beginning to end. Cycle time is always less than the takt time.
- 2) Manufacturing Lead Time: The PLT represent the total time – value and non- value added.
- 3) Takt time: It is the ratio between total working hours in a shift to the total customer demand in a one shift.

## V. VALUE STREAM MAPPING STEPS

### A. Value Stream Mapping

An value stream is an show of all activities value and also non- value added that are required to bring an item or a gathering of items that utilization the same assets through the principle streams, from raw material to the arms of consumer. These activities are those in the general production network including both data and task stream, which are the center of any effective lean task. Value stream mapping is an undertaking change tool to aid showing the whole production process, material and information flow.

## VI. ASSEMBLY PROCESS

Production assembly line total working station is 35 in which divide two subdivision semi-finished line and finished line

- 1) Semi-finished line
- 2) Finished line

### A. Semi-finished line

- 1) The operator working on averaging machine can also work on half crank bore roughing spm after averaging of a batch of 6 cylinder blocks. It will reduce the work in process on cam bore roughing spm.
- 2) The loading and unloading on cnc machine should be automated (robotic arm) so that the manual work taking extra time on cnc machines hmc 1, vmc 1, vmc 2 and hmc 10, hmc 3 and hmc 2 can be reduced.
- 3) machines such as cam bore roughing spm, half crank bore roughing spm, angular oil hole drilling machines

(from crank bore side & head side) should be cleaned for chips when machine is idle.

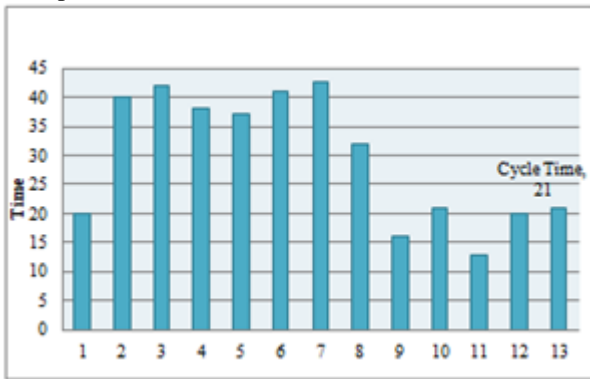


Fig. 1: Semi finish line

**B. Finished line**

- 1) The Intermediate Washing machine is divided into 9 zones and after the cleaning option in every zone it has an option to load another block in first flood cleaning zone at the same time the previous block will enter into the next zone for cleaning.

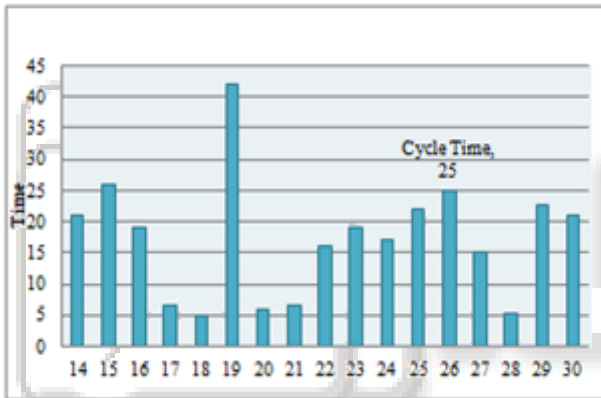


Fig.2: Finish line

- 2) Therefore the washing machine can be treated as
- 3) 9 different processes. So, if the inventory before the Washing machine is maintained such that to provide a cylinder block to load after every cleaning zone operation, the machine operation can be synchronized with takt time.
- 4) The block should be inspected at the start of the semi finish line. The operator working at the averaging machine has idle time, so he can inspect the block for the casting defects at the start

**C. Value Stream Mapping for Assembly Process**

The procedure analysis is done by gathering information from different inquiries with shop floor specialists and straight forwardly partakes in estimating the time associated with different procedures.

**1) Gathering Data:**

A fundamental part in making the VSMs for the procedure was to obtain existing information. There were a couple of manners by which we select data or measurement. The main, we obtained information straight forwardly from the organization. To do this we chatted with the task directors of each plant and in addition the floor administrators.

**2) Time Studies:**

While we got generation and work direction information from the organization, and in addition watched the plants in movement, we needed to lead our own particular time concentrates to get correct data on the process time inside plant

**VII. HOW TO CREAT CURRENT STATE MAP**

To create the current state map and future state map with the customer demand in which some step are followed-

- 1) Step I- takt time: It is the ration of total working hours in one shift to the total one shift demand.

**Total available time per shift (8 hr.) = 480 min**

**Lunch time decided by management = 30 min**

**- 30 min (lunch = 450min**

**available working hours per shift = 450 min**

**Daily forecasting demand = 13 pieces**

**Takt time =  $\frac{\text{Net available Production time}}{\text{Demand from Customers}}$**

**Takt Time =  $450/13 = 34.61 \text{ min}$**

**For simplicity takt time is taken as 35 min.**

- 2) Step II- Customer demand: consumer demand is one shift or every day request of consumer according to require. Consumer request is 26 Units/day.
- 3) Step III-Process Flow: This step includes different procedures which are in sequence to finish item produce and calculate of process time, changeover time and uptime for each.
- 4) Step IV- Material Flow: The stream of material from raw to finished goods given by provider to consumer.
- 5) Step V-Information Flow: Different information with respect to process duration (c/t), changeover time (c/o), uptime, takt time and so on.
  - a) Manually information flow
  - b) Electronic information flow

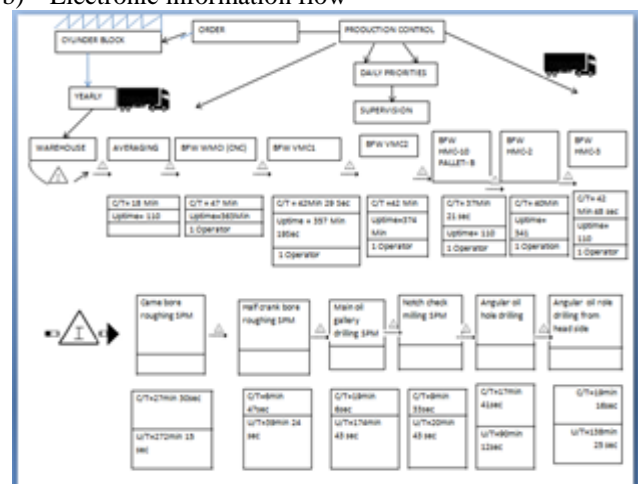


Fig. 3: Current state value stream map

- 6) Step VI- Calculate Total Product Cycle Time: After both material and information flows in map the time line display in the bottom in which show cycle time , value added time and non- value added time.
- 7) Step VII-Off-Line Activities: Activities like putting in of request, supply of material, every day plan. Month to month gauge and so forth is associated with this segment

which is top notch by transportation, provider symbols and data stream lines.

- 8) Step VIII-Identify Opportunities for Improvement: Gathering of chances and furthermore to compose a synopsis on these perceptions to further.

### VIII. RESULT AND CONCLUSION

This paper work has been proposed to Value Stream Mapping (VSM), which is turning into a basic tool for acknowledging lean assembling in real production settings. Fundamental ideas have been talked about, as have normal symbol and terminology, systems, and educational modules mixture methods. The outcomes are appeared as present and future state Mapping and change is appeared in the decrease in stock and Takt Time.

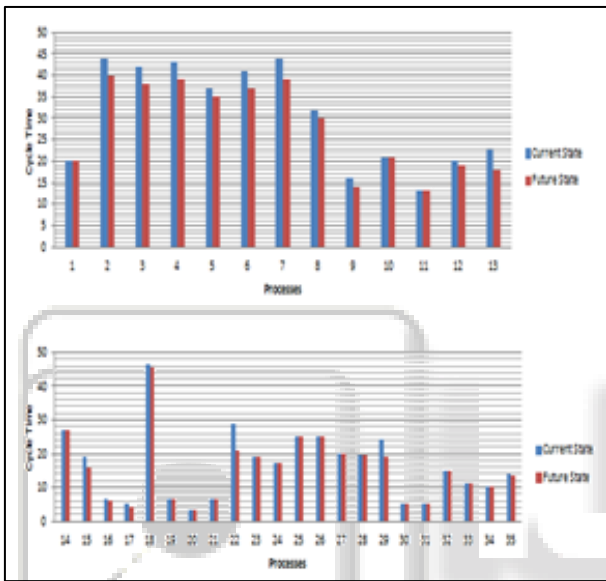


Fig. 4: Result of semi finish and finish line  
 Reduction in lead time is 19.41% in semi finish line.  
 1) Reduction in lead time is 22.17 % in finish line.  
 2) An average reduction of machine line as a whole is observed as approximately 20.57%.

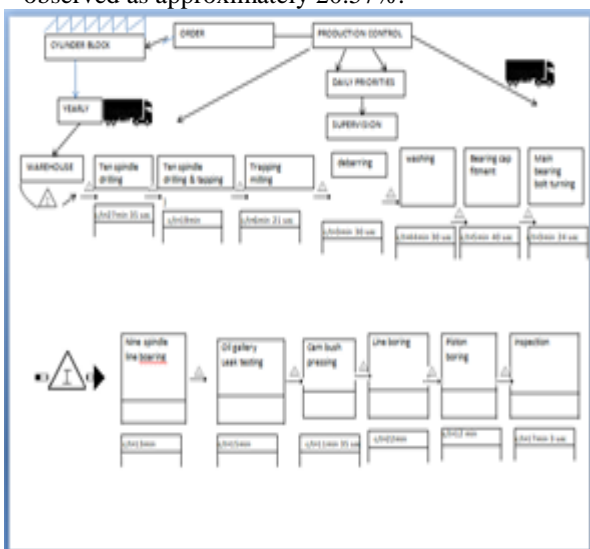


Fig. 5: Future state map

- 3) Machine line is optimized by making Intermediate Washing Operation as Pacemaker process.
- 4) Sharing of operator for more than one work stations can significantly help in eliminating the ‘Bottlenecks’.

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